AMENDMENTS TO THE CLAIMS

Claim 1 (Currently amended): A method of simulating a circuit having a hierarchical data structure, comprising:

representing the circuit as a hierarchically arranged set of branches, including a root branch and a plurality of other branches logically organized in a graph; the hierarchically arranged set of branches including a first branch that includes one or more leaf circuits and a second branch that includes one or more leaf circuits; wherein the first branch and second branch are interconnected in the graph through a third branch at a higher hierarchical level in the graph than the first and second branches;

selecting a group of leaf circuits from the first and second branches for simulation;

~~if two or more leaf circuits of the circuit having a substantially same isomorphic behavior,~~ representing the two or more leaf circuits as a merged leaf circuit in response to two or more leaf circuits of the circuit having a substantially same isomorphic behavior;

creating a first port connectivity interface dynamically for the group of leaf circuits in response to the merged leaf circuit; wherein the first port connectivity interface communicates changes in signal conditions among the group of leaf circuits; and

simulating the group of leaf circuits in accordance with the first port connectivity interface.

Claim 2 (Currently amended): The method of claim 1, wherein the substantially same isomorphic behavior comprises:

a substantially same set of input signals within a predetermined threshold of signal tolerance are received by the two or more leaf circuits;

a substantially same set of internal topologies, internal states and external loads within a predetermined threshold of signal tolerance associated with ~~are observed by~~ the two or more leaf circuits; and

a substantially same set of output signals are produced within a predetermined threshold of signal tolerance by the two or more leaf circuits in response to the substantially same set of input signals.

Claim 3 (Original): The method of claim 1, wherein the substantially same isomorphic behavior is monitored at the output ports of the leaf circuits and at the first port connectivity interface of the group of leaf circuits.

Claim 4 (Original): The method of claim 1, wherein the first port connectivity interface comprises:

a set of input vectors for referencing to a set of input ports of one or more receiver leaf circuits;

a set of output vectors for referencing to a set of output ports of one or more driver leaf circuits;

a set of load vectors for referencing to a set of loads of the one or more driver leaf circuits; and

an array of storage elements for storing information associating the set of loads to the set of input ports.

Claim 5 (Currently amended): The method of claim 1, further comprising:

~~if the two or more leaf circuits represented by the merged leaf circuit demonstrating substantially different isomorphic behaviors,~~ splitting the merged leaf circuits into two or more individual leaf circuits <u>in response to the two or more leaf circuits represented by the merged leaf circuit demonstrating substantially different isomorphic behaviors</u>;

creating a second port connectivity interface dynamically for the selected group of leaf circuits in response to the two or more individual leaf circuits; wherein the second port connectivity interface communicates changes in signal conditions among the group of leaf circuits; and

simulating the group of leaf circuits in accordance with the second port connectivity interface.

Claim 6 (Currently amended): The method of claim 5, wherein substantially different isomorphic behaviors include one or more elements selected from the group consisting of:

a substantially different set of input signals <u>within a predetermined threshold of signal tolerance</u> are received by the two or more leaf circuits;

a substantially different set of internal topologies, internal states and external loads within a predetermined threshold of signal tolerance associated with ~~are observed by~~ the two or more leaf circuits; and

a substantially different set of output signals are produced within a predetermined threshold of signal tolerance by the two or more leaf circuits in response to the substantially same set of input signals.

Claim 7 (Original): The method of claim 5, wherein the substantially different isomorphic behaviors are monitored at the output ports of the leaf circuits and at the second port connectivity interface of the group.

Claim 8 (Original): The method of claim 5, wherein the second port connectivity interface comprises:

a set of input vectors for referencing to a set of input ports of one or more receiver leaf circuits;

a set of output vectors for referencing to a set of output ports of one or more driver leaf circuits;

a set of load vectors for referencing to a set of loads of the one or more driver leaf circuits; and

an array of storage elements for storing information associating the set of loads to the set of input ports.

Claim 9 (Currently amended): A system for simulating a circuit having a hierarchical data structure, comprising:

at least one processing unit for executing computer programs;

a user interface for performing at least one of the functions selected from the group consisting of entering a netlist representation of the circuit, viewing representations of the circuit on a display, and observing simulation results of the circuit;

a memory for storing static and dynamic information of the circuit;

a simulator module for simulating a circuit having a hierarchical data structure, wherein the simulator module is used in conjunction with at least a processing unit, a user interface and a memory, and the simulator module includes:

means for representing the circuit as a hierarchically arranged set of branches, including a root branch and a plurality of other branches logically organized in a graph; the hierarchically arranged set of branches including a first branch that includes one or more leaf circuits and a second branch that includes one or more leaf circuits; wherein the first branch and second branch are interconnected in the graph through a third branch at a higher hierarchical level in the graph than the first and second branches;

means for selecting a group of leaf circuits from the first and second branches for simulation;

~~if two or more leaf circuits of the circuit having a substantially same isomorphic behavior,~~ means for representing the two or more leaf circuits as a merged leaf circuit in response to two or more leaf circuits of the circuit having a substantially same isomorphic behavior;

means for creating a first port connectivity interface dynamically for the group of leaf circuits in response to the merged leaf circuit; wherein the first port connectivity interface communicates changes in signal conditions among the group of leaf circuits; and

means for simulating the group of leaf circuits in accordance with the first port connectivity interface.

Claim 10 (Currently amended): The system of claim 9, wherein the substantially same isomorphic behavior comprises:

a substantially same set of input signals within a predetermined threshold of signal tolerance are received by the two or more leaf circuits;

a substantially same set of internal topologies, internal states and external loads within a predetermined threshold of signal tolerance associated with ~~are observed by~~ the two or more leaf circuits; and

a substantially same set of output signals are produced within a predetermined threshold of signal tolerance by the two or more leaf circuits in response to the substantially same set of input signals.

Claim 11 (Original): The system of claim 9, wherein the substantially same isomorphic behavior is monitored at the output ports of the leaf circuits and at the first port connectivity interface of the group of leaf circuits.

Claim 12 (Original): The system of claim 9, wherein the first port connectivity interface comprises:

a set of input vectors for referencing to a set of input ports of one or more receiver leaf circuits;

a set of output vectors for referencing to a set of output ports of one or more driver leaf circuits;

a set of load vectors for referencing to a set of loads of the one or more driver leaf circuits; and

an array of storage elements for storing information associating the set of loads to the set of input ports.

Claim 13 (Currently amended): The system of claim 9, further comprising:

~~if the two or more leaf circuits represented by the merged leaf circuit demonstrating substantially different isomorphic behaviors,~~ splitting the merged leaf circuits into two or more individual leaf circuits <u>in response to the two or more leaf circuits represented by the merged leaf circuit demonstrating substantially different isomorphic behaviors</u>;

creating a second port connectivity interface dynamically for the selected group of leaf circuits in response to the two or more individual leaf circuits; wherein the second port connectivity interface communicates changes in signal conditions among the group of leaf circuits; and

simulating the group of leaf circuits in accordance with the second port connectivity interface.

Claim 14 (Currently amended): The system of claim 13, wherein substantially different isomorphic behaviors include one or more elements selected from the group consisting of:

a substantially different set of input signals <u>within a predetermined threshold of signal tolerance</u> are received by the two or more leaf circuits;

a substantially different set of internal topologies, internal states and external loads within a predetermined threshold of signal tolerance associated with ~~are observed by~~ the two or more leaf circuits; and

a substantially different set of output signals are produced within a predetermined threshold of signal tolerance by the two or more leaf circuits in response to the substantially same set of input signals.

Claim 15 (Original): The system of claim 13, wherein the substantially different isomorphic behaviors are monitored at the output ports of the leaf circuits and at the second port connectivity interface of the group.

Claim 16 (Original): The system of claim 13, wherein the second port connectivity interface comprises:

a set of input vectors for referencing to a set of input ports of one or more receiver leaf circuits;

a set of output vectors for referencing to a set of output ports of one or more driver leaf circuits;

a set of load vectors for referencing to a set of loads of the one or more driver leaf circuits; and

an array of storage elements for storing information associating the set of loads to the set of input ports.

Claim 17 (Currently amended): A computer program product, comprising a medium storing computer programs for executing by one or more computer systems, the computer program comprising:

a simulator module for simulating a circuit having a hierarchical data structure, wherein the simulator module is used in conjunction with at least a processing unit, a user interface and a memory, and the simulator module includes one or more computer programs containing instructions for:

representing the circuit as a hierarchically arranged set of branches, including a root branch and a plurality of other branches logically organized in a graph; the hierarchically arranged set of branches including a first branch that includes one or more leaf circuits and a second branch that

includes one or more leaf circuits; wherein the first branch and second branch are interconnected in the graph through a third branch at a higher hierarchical level in the graph than the first and second branches;

selecting a group of leaf circuits from the first and second branches for simulation;

~~if two or more leaf circuits of the circuit having a substantially same isomorphic behavior,~~ representing the two or more leaf circuits as a merged leaf circuit in response to two or more leaf circuits of the circuit having a substantially same isomorphic behavior;

creating a first port connectivity interface dynamically for the group of leaf circuits in response to the merged leaf circuit; wherein the first port connectivity interface communicates changes in signal conditions among the group of leaf circuits; and

simulating the group of leaf circuits in accordance with the first port connectivity interface.

Claim 18 (Currently amended): The computer program product of claim 17, wherein the substantially same isomorphic behavior comprises:

a substantially same set of input signals within a predetermined threshold of signal tolerance are received by the two or more leaf circuits;

a substantially same set of internal topologies, internal states and external loads within a predetermined threshold of signal tolerance associated with ~~are observed by~~ the two or more leaf circuits; and

a substantially same set of output signals are produced within a predetermined threshold of signal tolerance by the two or more leaf circuits in response to the substantially same set of input signals.

Claim 19 (Original): The computer program product of claim 17, wherein the substantially same isomorphic behavior is monitored at the output ports of the leaf circuits and at the first port connectivity interface of the group.

Claim 20 (Original): The computer program product of claim 17, wherein the first port connectivity interface comprises:

a set of input vectors for referencing to a set of input ports of one or more receiver leaf circuits;

a set of output vectors for referencing to a set of output ports of one or more driver leaf circuits;

a set of load vectors for referencing to a set of loads of the one or more driver leaf circuits; and

an array of storage elements for storing information associating the set of loads to the set of input ports.

Claim 21 (Currently amended): The computer program product of claim 17, further comprising instructions for:

~~if the two or more leaf circuits represented by the merged leaf circuit demonstrating substantially different isomorphic behaviors,~~ splitting the merged leaf circuits into two or more individual leaf circuits <u>in response to the two or more leaf circuits represented by the merged leaf circuit demonstrating substantially different isomorphic behaviors</u>;

creating a second port connectivity interface dynamically for the selected group of leaf circuits in response to the two or more individual leaf circuits; wherein the second port connectivity interface communicates changes in signal conditions among the group of leaf circuits; and

simulating the group of leaf circuits in accordance with the second port connectivity interface.

Claim 22 (Currently amended): The computer program product of claim 21, wherein substantially different isomorphic behaviors include one or more elements selected from the group consisting of:

a substantially different set of input signals <u>within a predetermined threshold of signal tolerance</u> are received by the two or more leaf circuits;

a substantially different set of internal topologies, internal states and external loads <u>within a predetermined threshold of signal tolerance associated with</u> ~~are observed by~~ the two or more leaf circuits; and

a substantially different set of output signals are produced within a predetermined threshold of signal tolerance by the two or more leaf circuits in response to the substantially same set of input signals.

Claim 23 (Original): The computer program product of claim 21, wherein the substantially different isomorphic behaviors are monitored at the output ports of the leaf circuits and at the second port connectivity interface of the group.

Claim 24 (Original): The computer program product of claim 21, wherein the second port connectivity interface comprises:

a set of input vectors for referencing to a set of input ports of one or more receiver leaf circuits;

a set of output vectors for referencing to a set of output ports of one or more driver leaf circuits;

a set of load vectors for referencing to a set of loads of the one or more driver leaf circuits; and

an array of storage elements for storing information associating the set of loads to the set of input ports.